What is claimed is:

1. A method of producing a transgenic avian, said method comprising:

   (a) microinjecting into a cell of an avian embryo a nucleic acid comprising a transgene comprising a nucleotide sequence encoding a heterologous polypeptide;

   (b) introducing the microinjected avian embryo into an oviduct of a recipient hen, such that the recipient hen lays a shelled egg containing the microinjected avian embryo; and

   (c) incubating the shelled egg containing the microinjected avian embryo until said shelled egg hatches, thereby producing a transgenic avian containing the transgene.

2. The method of Claim 1, wherein the avian embryo is an early stage embryo having a germinal disk and said nucleic acid is microinjected into said germinal disk.

3. The method of Claim 1, wherein the heterologous polypeptide is delivered to the white of a developing avian egg produced by the transgenic avian.

4. The method of Claim 1, wherein the avian is a chicken.

5. The method of Claim 1, wherein the nucleotide sequence encoding said heterologous polypeptide is operably linked to a transcriptional regulatory element that can direct gene expression in one or more cells of said transgenic avian.

6. The method of Claim 5, wherein the transcriptional regulatory element is a tissue specific promoter.

7. The method of Claim 6, wherein the tissue specific promoter is specific for the magnum.

8. The method of Claim 1, wherein the nucleic acid is combined with a nuclear localization signal (NLS) peptide prior to said microinjection.

9. The method of Claim 1, wherein the nucleotide sequence encoding a heterologous polypeptide is optimized for codon usage by an avian.

10. The method of Claim 1, wherein the transgene comprises an internal ribosome entry site (IRES).

11. The method of Claim 10, wherein the transgene comprises at least two nucleotide sequences each encoding a heterologous polypeptide.

12. The method of Claim 11, wherein the transgene comprises at least two nucleotide sequences encode at least two heterologous peptides that form a multimeric protein.

13. The method of Claim 12, wherein the multimeric protein specifically binds a selected ligand.

14. The method of Claim 13, wherein the multimeric protein is an antibody.

15. The method of Claim 1, wherein the nucleic acid is a bacterial artificial chromosome (BAC).

16. The method of Claim 15, wherein the BAC comprises a heterologous polypeptide-encoding sequence inserted into OMC24 (SEQ ID NO. 42).

17. The method of Claim 16, wherein the heterologous polypeptide-encoding sequence is operably linked to an IRES.

18. The method of Claim 1, wherein the nucleic acid is not a eukaryotic viral vector.

19. The method of Claim 3 further comprising isolating said heterologous peptide from said transgenic avian or an egg laid by said transgenic avian.

20. A method of isolating a non-avian protein, said method comprising:
(a) obtaining an egg from a transgenic avian that expresses said non-avian protein in egg white of said egg, said transgenic avian comprising a transgene comprising a nucleotide sequence encoding said non-avian protein, said transgene not having been introduced into said trangenic avian or founder ancestor thereof using a eukaryotic viral vector; and
(b) isolating said non-avian protein from said egg.

21. The method of Claim 20, wherein the avian is a chicken.

22. The method of Claim 20, wherein the nucleotide sequence encoding said non-avian protein is operably linked to a transcriptional regulatory element that can direct gene expression in one or more cells of said transgenic avian.

23. The method of Claim 22, wherein the transcriptional regulatory element is the promoter region of the avian gene encoding ovomucoid.

24. The method of Claim 20, wherein the transgene comprises an internal ribosome entry site (IRES).

25. The method of Claim 24, wherein the transgene comprises at least two nucleotide sequences each encoding a non-avian protein.

26. The method of Claim 25, wherein the transgene comprises at least two nucleotide sequences encode at least two non-avian proteins that form a multimeric protein.

27. The method of Claim 26, wherein the multimeric protein specifically binds a selected ligand.

28. The method of Claim 27, wherein the multimeric protein is an antibody.

29. The method of Claim 20, wherein the nucleotide sequence is a bacterial artificial chromosome (BAC).

30. The method of Claim 29, wherein the BAC comprises a non-avian protein-encoding sequence inserted into OMC24 (SEQ ID NO. 42).

31. The method of Claim 30, wherein the heterologous polypeptide-encoding sequence is operably linked to an IRES.

32. A nucleic acid vector for expression of a heterologous polypeptide in egg white of a transgenic chicken, said nucleic acid vector comprising a first nucleotide sequence comprising the nucleotide sequence of SEQ ID NO:42 and a second nucleotide

sequence encoding said heterologous polypeptide, wherein said second sequence is inserted into a portion of said first nucleotide sequence that is transcribed but not translated in a cell in which the ovomucoid promoter is operable.

33. The nucleic acid vector of Claim 32 wherein said second nucleic acid sequence is operably linked to an IRES sequence.

34. The nucleic acid vector of Claim 33 wherein said second nucleotide sequence is inserted in the 3' UTR of the ovomucoid gene.

35. The nucleic acid vector of Claim 32 wherein said heterologous polypeptide is selected from the group consisting of a heavy chain of an antibody or a light chain of an antibody.

36. The nucleic acid vector of Claim 35, wherein the antibody is a human antibody.

37. The nucleic acid vector of Claim 35, wherein the antibody is a humanized antibody.

38. A transgenic avian that produces at least one heterologous polypeptide in egg white, wherein the transgenic avian comprises a transgene that comprises a nucleic acid sequence encoding said heterologous polypeptide, said transgene not having been introduced into said transgenic avian or founder ancestor thereof using a eukaryotic viral vector.

39. A transgenic avian produced by the method of Claim 1.

40. The transgenic avian of Claim 38 or 39, wherein the avian is a chicken.

41. The transgenic avian of Claim 38 or 39, wherein the transgenic avian produces a heterologous multimeric protein.

42. The transgenic avian of Claim 41, wherein the heterologous multimeric protein specifically binds a selected ligand.

43. The transgenic avian of Claim 41, wherein the heterologous multimeric protein is an antibody.

44. The transgenic avian of Claim 43, wherein the antibody is a human antibody.

45. The transgenic avian of Claim 43, wherein the antibody is a humanized antibody.

46. An avian egg produced by the transgenic avian of Claim 38 or 39.

47. An avian egg produced by the transgenic avian of Claim 43.

48. A heterologous protein produced by the transgenic avian of Claim 38 or 39, wherein the heterologous protein comprises a heterologous polypeptide selected from the group consisting of a cytokine, a hormone, an enzyme, a structural protein, and an immunoglobulin polypeptide.

49. The heterologous protein of Claim 48, wherein the heterologous protein is a multimeric protein.

50. The heterologous protein of Claim 48, wherein the heterologous protein is an antibody.

51. The heterologous protein of Claim 50, wherein the antibody is a human antibody.

52. The heterologous protein of Claim 50, wherein the antibody is a humanized antibody.